

CLAIMS

What is claimed is:

1. A rotary electric motor comprising:

a rotor having a plurality of permanent magnets disposed in an annular ring configuration, the magnets alternating in magnetic polarity along an inner annular surface;

5 a stator of annular ring construction encompassed within the rotor and separated therefrom by a radial air gap, the stator comprising:

a plurality of ferromagnetic core segments

ferromagnetically isolated from each other, each of the core

segments having respective coils wound thereon to form stator

10 windings;

an outer radial periphery at the air gap; and

an inner radial periphery defining a volume within

which substantially no flux traverses; and

a controller contained within the volume for applying energization

15 current to the stator windings.

2. A rotary electric motor as recited in claim 1, wherein said motor is a brushless motor and wherein said volume further comprises:

electronic switches responsive to the controller for directing current from a power supply to the stator windings.

3. A rotary electric motor as recited in claim 2, wherein the said

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volume further comprises a power supply.

4. A rotary electric motor as recited in claim 3, wherein the stator further comprises a rotor position sensor having an output connected to the controller.

5. A rotary electric motor as recited in claim 2, wherein each stator segment comprises a pair of poles circumferentially spaced from each other at the outer periphery and joined together by a yoke or linking portion at the inner periphery, the pair of poles having opposite magnetic polarities at the air gap when energization current is supplied to the segment winding.

6. A rotary electric motor as recited in claim 5, wherein the winding of each stator segment comprises a winding portion on each stator pole, the winding portions of each pole pair being wound in opposite directions and connected in series.

7. A rotary electric motor as recited in claim 5, wherein the winding of each stator segment is formed on the yoke or linking portion.

8. A rotary electric motor as recited in claim 2, wherein the electronic switches are connected in bridge configurations, connected respectively to corresponding stator segment windings.

9. A rotary electric motor as recited in claim 8, wherein the width of

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the current pulses and the selection of the switches are controlled by the controller in response to signals received from the rotor position sensor.

10. A rotary electric motor as recited in claim 3, wherein said power supply comprises a plurality of replaceable batteries.

11. A rotary electric motor as recited in claim 10, wherein said batteries are rechargeable batteries capable of being recharged from an external source when removed from the stator and of being recharged by regenerative current applied by the stator segment windings.

12. A rotary electric motor as recited in claim 10, wherein said batteries are rechargeable from an external source.

13. A rotary electric motor as recited in claim 2, wherein said volume further comprises a circuit board having mounted thereon the controller and switches.

14. A rotary electric motor as recited in claim 13, wherein said controller comprises an application specific integrated circuit (ASIC).

15. A rotary electric motor as recited in claim 1, where said volume is substantially cylindrical.

16. A rotary electric motor comprising:

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a rotor having a plurality of permanent magnets disposed in an annular ring configuration, the magnets alternating in magnetic polarity along an inner annular surface;

5        a stator of annular ring construction encompassed within the rotor and separated therefrom by a radial air gap, the stator comprising a plurality of ferromagnetic core segments having respective coils wound thereon to form stator windings, the stator having an outer radial periphery at the air gap and an inner radial periphery defining a volume within which substantially no flux

10      traverses; and

      a controller contained within the volume for applying energization current to the stator windings.

17. A rotary electric motor as recited in claim 16, where said volume is substantially cylindrical.

18. A rotary electric motor as recited in claim 16, wherein said motor is a brushless motor and wherein said volume further comprises:

      a power supply and electronic switches responsive to the controller for directing current excitation from the power supply to the stator windings.